Remarks

This Response is submitted with a Request for Continued Examination. Entry of the above amendments into the official file is respectfully requested. Entry of the above amendments into the official file is conditioned on entry of the amendments into the official file from the Response submitted November 21, 2008.

The Applicants have amended Claim 11 to change the relationship (Nb/93)/C/12)=0.2 to 0.7 by replacing "0.7" and substituting "less than 0.5." This new range is inherently supported by the original disclosure as well as paragraph [0038] in the Applicants' specification. Claim 11 has also been amended to recite that the steel microstructure contains a grain size of 8 μm or less. This is merely in accordance with Claim 17.

Claim 16 has also been amended with respect to the grain size of 8 μm or less in accordance with Claim 17. The relationship has also been amended to replace "0.7" with "less than 0.5" as in Claim 11. A similar change has been made to Claim 17.

All of the claims stand rejected under 35 USC §103 over JP '941. The Applicants note with appreciation the Examiner's detailed comments hypothetically applying JP '941 in the Advisory Action. The Applicants nonetheless submit that JP '941 does not render Claims 11 – 29 obvious for the reasons set forth below.

The rejection mentions that JP '941 states that "because the effect of Nb and Ti is substantially small when compared with that of V, deep drawability which is an effect of the instant invention is unable to be heightened sufficiently by merely adding Nb and Ti, while no addition of V, into a steel slab" and pointed out that r values of the Applicants' examples are lower when compared with those of JP '941 and conclude that the Applicants' steel sheets are

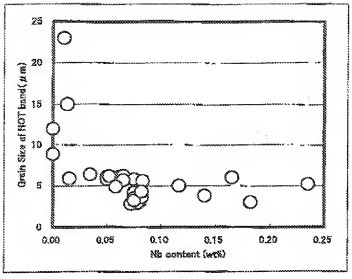
inferior to those of JP '941. However, the Applicants do not believe that this conclusion is correct. Reasons are set forth below.

Steel G in Table 1 of JP '941 does not add Nb and Ti, whereas V is added and (V/51)/(C/12) is 0.33. Steel sheet No. 9 in Table 2 of JP '941 has an r value of Steel G of no more than 0.8. On the other hand, the Applicants' steels J, K and L in Table 1 in terms of (Nb/93)/(C/12) is in a range of 0.26 to 0.29. The Applicants' steel sheets Nos. 17, 18 and 19 in Table 2-1 have r values of steel J, K and L as much as 1.3 to 1.4.

This indicates that the conclusions in the rejection, namely, V has an effect of improving the r value rather than Nb and Ti, cannot be logical. In JP '941, the r value is increased by addition of V and a large amount of V is added in proportion to C equivalent as seen in steels A, H and L. However, with a small amount of addition as with the Applicants' steels, r value is considered to be low.

The fact that r value of 1.2 or more is secured by adding a small amount of Nb by the Applicants is believed to originate as an effect of "fining of ferrite grain size of a hot-rolled sheet." As is apparent from the following diagram which shows some of the Applicants' examples, the foregoing fact can be achieved only with addition of Nb by 0.01% or more. In this instance, as a condition of hot rolling, an FDT of 800°C or more and a CT of 400 to 720°C becomes necessary.

In sharp contrast, JP '941 specifies an FDT of 700°C or more from the viewpoint of non-uniformity of the structure of the base sheet and rolling load of CT of 800°C or less in view of scale loss and fining of ferrite grains size of a hot-rolled sheet is not secured and obtainment thereby of a high r value is impossible.



As mentioned above, the Applicants' steels achieve an r value of 1.2 or more with a small amount of addition of alloy elements, while expensive V is not used. This is not obvious in view of JP '941.

To further clarify, the non-obviousness of the Applicants' steel sheets over JP '941, the Applicants have amended Claim 1 to specify Nb:0.01-0.3% and (Nb/93)/(C/12)=0.2 or more to less than 0.5. In the Applicants' methods, precipitation and fixation of solid solution C by Nb is not conducted positively at the hot rolling stage. If precipitation and fixation of C is performed completely, "it is impossible to have C content necessary for forming a martensite phase present in the steel." The Applicants achieve a high r value by "fining of ferrite grain size of a hot-rolled sheet" with no addition of V yet with the addition of the above-mentioned Nb by 0.01% or more.

On the other hand, in JP '941, fixing by V is based on (V/51)/(C/12)=0.5 to 3.0 while all the examples, other than example by (V/51)/(C/12)=0.76, include (V51)/(C/12)=1.0 or more. In this way, according to JP '941, precipitation and fixation of solid solution C by V in a hot rolling stage is positively conducted.

In addition to this, addition of V brings about the following harmful influence as explained in the Applicants' specification:

1. V is expensive and increases costs;

2. V heightens, during cold-rolling, resistance to deformation and hence, decrease in productivity is concerned; and

3. recrystallization behavior changes by the effect of fine precipitates and this increases in-plane anisotropy of an r value.

The Applicants succeeded, with no addition of V, in providing a steel sheet having high strength and a high r value. Withdrawal of the rejection is respectfully requested.

In light of the foregoing, the Applicants respectfully submit that the entire application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,

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